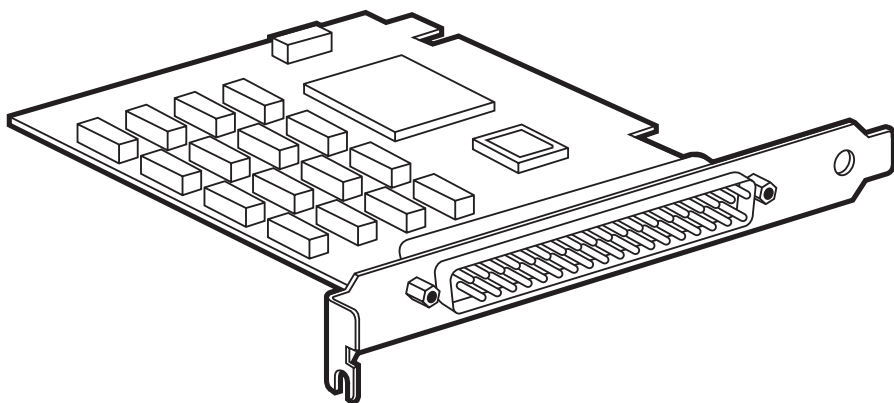




## Relay Output Card, PCI



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**CUSTOMER  
SUPPORT  
INFORMATION**

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**  
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**  
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018  
Web site: [www.blackbox.com](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

**FEDERAL COMMUNICATIONS COMMISSION  
AND  
INDUSTRY CANADA  
RADIO FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.*

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.*

### EMC DIRECTIVE STATEMENT



Products bearing the CE label fulfill the requirements of the EMC Directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

- EN55022 Class A—“Limits and methods of measurement of radio interference characteristics of information technology equipment.
- EN50082-1—“Electromagnetic Compatibility—Generic Immunity Standard” Part 1: Residential, commercial, and light industry.
- EN60950 (IEC950)—“Safety of information technology equipment, including electrical business equipment.

## **NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT**

### **INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

**TRADEMARKS USED IN THIS MANUAL**

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Linux® is a registered trademark of Linus Torvalds.

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# 1. Specifications

**Compliance**—CE approval; FCC Part 15, Class A

**Channels**—16 relays

**Relay Contact Power Ratings**—10 watts maximum

**Relay Contact Voltage Maximum**—100 volts DC or AC maximum

**Relay Contact Current Maximum**—0.5 amps DC or AC RMS

**Relay Contact Resistance, Initial**—0.15 ohms

**Relay Rated Life**—*Low Load*: 200 million closures; *Maximum Load*: 100 million closures

**Relay Contact Speed**—*Operate*: 0.5 ms; *Release*: 0.5 ms; *Bounce*: 0.5 ms

**Maximum Operating Speed**—600 Hz

**Connectors**—(1) DB37 male

**MTBF**—Greater than 150,000 hours, excluding relays. Relay life expectancy depends on actual application usage.

**Temperature**—*Operating*: 32 to 122°F (0 to 50°C); *Storage*: -4 to +158°F (-20 to +70°C)

**Humidity**—10 to 90%, noncondensing

**Power**—From the PCI bus

**Size**—*Including goldfingers*: 3.9"H x 5"L (9.9 x 12.7 cm);  
*Excluding goldfingers*: 3.6"H x 5"L (9.1 x 12.7 cm)

**Weight**—3.2 oz. (90.7 g)



## 2. Introduction

### 2.1 Overview

The Relay Output Card, PCI provides 16 reed relays that can latch power, data, or other electronic signals for control applications. The Card is PCI 2.1 bus compliant.

### 2.2 What the Package Includes

Your package should contain the following items:

- (1) Relay Output Card, PCI
- (3) Systems software diskettes: (1) disk with drivers for DOS and Windows® 95, (2) disks with drivers for Windows 98, 2000, or Windows NT®
- This users' manual

If anything is missing or damaged, please call Black Box at 724-746-5500.

### 2.3 Features

- 16 SPST relays.
- DB37 male connector.
- Highly reliable 10-VA DIP reed relays.
- Multiple adapters can reside in the same computer.
- PCI 2.1 bus compliant.

## 2.4 Reed Relays

Reed relays provide very-high-quality, long-life, low-power, dry-contact switch closures. Reed relays are not suited for high-current applications, and can be destroyed by inductive load switching, where a spark occurs across the contacts internally. The relays are normally open, and close when energized.

Port Bit		Relay-K#	DB37 Male Connector and Pin No.
Port C Bit	0	K1	2, 20
	1	K2	3, 21
	2	K3	4, 22
	3	K4	5, 23
	4	K5	6, 24
	5	K6	7, 25
	6	K7	8, 26
	7	K8	9, 27
Port D Bit	0	K9	10, 28
	1	K10	11, 29
	2	K11	12, 30
	3	K12	13, 31
	4	K13	14, 32
	5	K14	15, 33
	6	K15	16, 34
	7	K16	17, 35
Ground			18, 36, 37
+5 volts			19
+12 volts			1

## 2.5 Software

The Relay Output Card, PCI ships with an I/O suite of software drivers. Popular development environments, including Visual C++, Visual Basic, and Delphi, are supported for application development. The Card includes a utility for configuring the driver parameters under Windows, further simplifying installation.

For DOS, QNX, Linux®, and other operating systems, please refer to the software included with your card.

### 2.6 Programming Examples

Below are several simple examples using 80 x 86 assembly code for energizing and checking the state of the reed relays on the Card. All examples assume a base address of 300 hex.

#### *Programming Example #1:*

To set relay #3 on, write a “1” in bit-position D2, to port address base+3 or 303 hex.

```
MOV DX,303H      ;Set DX to Port D
MOV AL,00001000B ;Set DX to Port D
OUT DX, AL
```

*Programming Example #2, another method that takes into account the readback capability of the output ports C and D:*

```
MOV DX,303H      ;Set DX to Port D
IN AL,DX          ;Get old port setting
NOT AL           ;Invert bits—see the Note below
OR AL,00001000B   ;OR in bit 3
OUT DX,AL         ;Set bit 3
```

### NOTE

**Reading back the ports (C and D) results in the binary complement of the output.**

### 3. Register Description

Address	Mod	D7	D6	D5	D4	D3	D2	D1	D0
S	E								
Base+0	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+1	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+2	R/W	PCD	PCD	PCD	PCD	PCD	PCD	PCD	PCD
		7	6	5	4	3	2	1	0
Base+4	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+5	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+6	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+7	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}

RD = Read-only bits

R/W = Read/write bits

#### NOTE

The reed-relay ports have a non-destructive readback capability. Reading back the ports (A and B) results in the binary complement of the output. This is particularly useful when writing software that queries the last value written to prevent inadvertently changing state of the relays. Also, bits in the read-only ports (Base+0, 1, 4-7) are decoded but not used by the Card.

## 4. Installation

### **NOTE**

You must install the software before you setup the hardware.

### **4.1 Software Installation**

The Relay Output Card, PCI is a fully compliant PCI plug-and-play adapter. The I/O address is automatically assigned by either your system or your plug-and-play operating system.

*For Windows users:*

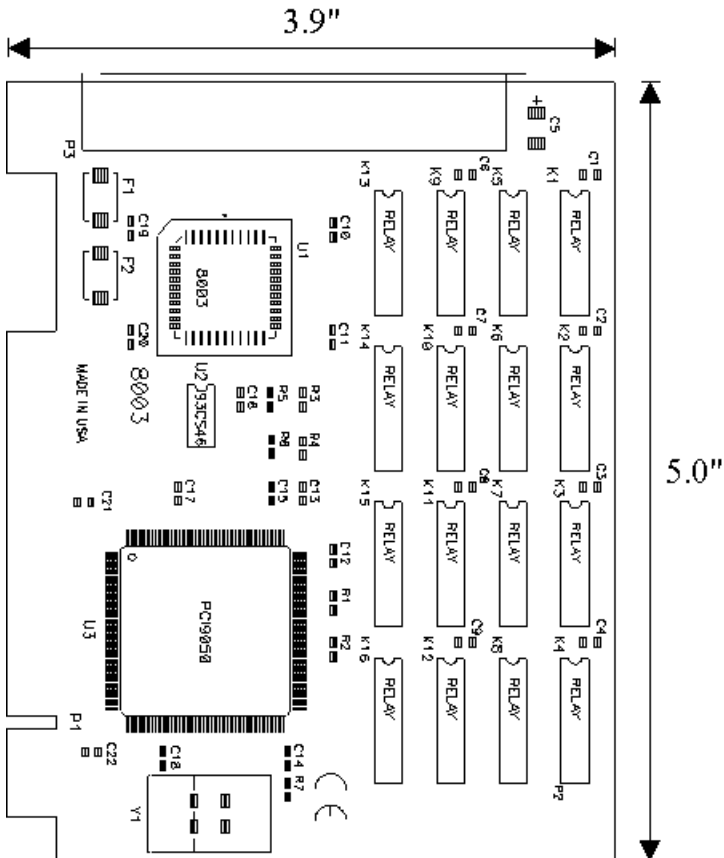
Choose “Install Software” at the beginning of the CD and select the digital I/O software drivers.

### **4.2 Hardware Installation**

1. Turn off the PC's power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available PCI slot and remove screw and the blank metal slot cover.
4. Gently insert the Card into the slot. Make sure that the Card is seated properly.
5. Replace the screw.
6. Replace the cover.
7. Connect the power cord.

Installation is complete.

# Appendix A. Board Layout



# Appendix B. Troubleshooting

## B.1 Calling Black Box

If you determine that your Relay Output Card, PCI is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

## B.2 Shipping and Packaging

If you need to transport or ship your Relay Output Card, PCI:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Relay Output Card, PCI for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Materials Authorization (RMA) number.



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